Catalogue No. 85.

MICROSCOPES

and

Accessory Apparatus.

ERNST LEITZ

WETZLAR Germany

NEW YORK U. S. A.

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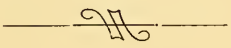
Catalogue Nr. 35

OF

Microscopes and Accessory Apparatus.



ERNST LEITZ

FACTORY
WETZLAR
GERMANY.

BRANCH
NEW YORK
411 WEST 59TH ST.
Near College of Physicians and Surgeons.

1894.

„Highest award“ worlds columbian Exhibition **Chicago 1893.**

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All prices are net, payable, without discount, at Wetzlar, Germany or New York.

All orders will be filled within a week after their receipt.

In ordering care should be taken to give the number of each article desired.

Goods are forwarded at the expense and risk of the purchaser.

Our instruments for use in Universities, Colleges, Schools &c. of the United States are by law free of duty and we shall be pleased to make special low quotations for such orders.

Ernst Leitz.

In presenting a new edition of our English catalogue we take pleasure in announcing the establishment of a **branch in New York**, where a full line of our goods is kept constantly on hand. This step has been necessitated by the very large demand for our instruments in the United States, where they have found their way into the laboratories of all the leading educational institutions, and are used by a very large number of physicians, naturalists and others. This cordial reception is the more significant and gratifying since in competing with instruments of American manufacture we have been forced to contend with a very high import duty. But notwithstanding this, the solidity and convenient size and arrangement of our stands and the unsurpassed excellence of our objectives have obtained for our instruments the general acceptance above referred to.

Besides the advantage to our patrons of being able at all times to see a full line of our goods, the New York Branch enables us to offer greatly increased facilities for repairs, which can now be made at the shortest notice and in the most efficient manner. Duplicate parts of all instruments of our manufacture are kept constantly on hand, and every facility is afforded for as careful workmanship as in Wetzlar.

Mr. William Krafft who is thoroughly conversant with every detail of our instruments is in charge of this branch, and all communications addressed to him will receive prompt attention.

Address: **WILLIAM KRAFFT,**
411 WEST 59TH ST.
Near College of Physicians and Surgeons.
New York City.

CONTENTS.

		Page
A.	Objectives	6
B.	Stands	14
C.	Microscopes for Mineralogical Examinations	37
D.	Illuminating Apparatus	44
E.	Dissecting Microscopes and Hand Lenses	45
F.	Apparatus for Measuring and Drawing	48
G.	Microtomes	54
H.	Miscellaneous Apparatus	56

A. The Objective.

In the construction for our lenses every device is considered which can in any way contribute to their excellence. They are made of the best Jena glass, whose index of refraction has been carefully computed, thus permitting the exact determination of the necessary radii of lenses, their focal distances, their greatest available apertures, e&. And similarly, it is possible to discover the point of error in any composite lens and to correct it, so that before leaving our hands all lenses of our manufacture have the same degree of excellence.

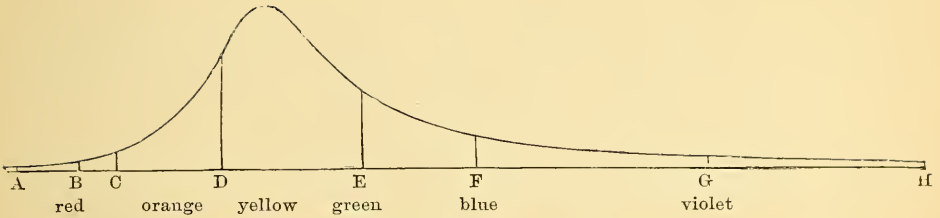
We construct objectives of three different types:

1. Achromatics,
2. Pantachromatics,
3. Apochromatics

whose peculiarities may be briefly stated as follows:

The achromatic objectives are of simpler construction than the others, but are carefully made and fulfill all the requirements of a good objective for general work:

1. They are achromatic and are corrected for the lightest part of the spectrum; between the lines D and F of the solar spectrum.
2. They are carefully corrected as regards spherical aberration.
3. The numerical aperture, upon which more than on anything else the definition of an objective depends, has been made as large in each case as was obtainable without resort to impairing the quality of the lens in some other particular.



Curve of intensity of the light rays of the spectrum.

The curve given above represents the intensity of the light rays of the solar spectrum, and it will be observed that in being corrected to transmit the rays between the Fraunhofer lines D and F, our lenses yield nearly all the light rays of the spectrum. In the construction of the "Pantachromatics" and "Apochromatics" a still greater degree of perfection has been obtained. In the case of the Pantachromatics greater achromatism has been obtained by the use of borate, phosphate and barite glass, and in the Apochromatics fluorite has been added also.

It is not possible to judge of the degree of achromatism from every preparation, for sections of tissue, stained bacteria &c. are poorly adapted to such tests. Thus, it becomes necessary to have certain generally recognized test objects, the degree of whose definition by a particular lens serves as an index of its excellence. For low powers various objects are employed, notably the scales of butterflies' wings; for high-power dry lenses, the Pleurosigma angulatum; and for the oil immersions the best object is the Surirella gemma. The Pantachromatics and Apochromatics are readily seen to have decided superiority over the Achromatics when tested with these objects. The Apochromatic 2 mm defines Surirella most perfectly, without a trace of colour, and yields the most perfect microscopic definition as yet obtainable by modern optics. The Pantachromatic P 2 occupies an intermediate place as regards excellence between the Apochromatic 2 mm and the Achromatic $^1/_{12}$. The numerical aperture of the Apochromatic 2 mm is 1.35; that of the Pantachromatic P 2 and of the Achromatic $^1/_{12}$ is 1.30.

The Pantachromatics and Apochromatics show a very decided superiority over the Achromatics for purposes of photomicrography in taking unstained specimens by direct sunlight. In taking either single or double stained specimens however, it is customary to bring out the differences in colour by the use of an orthochromatic plate and monochromatic yellow light. When used in this way the efficiency of the Achromatics is hardly inferior to that of the others.

All these different lenses can be used in connection with the ordinary Huyghenian eye-pieces, but for the high powers the Compensation oculars are to be particularly recommended.

The durability of the glass in all the objectives has received careful test, and only such glass is employed as has been abundantly shown to be capable of withstanding all ordinary changes of temperature.

All objectives are corrected for a coverglass of 0,17 mm thickness and for a tube length of 170 mm measured from the screw of the objective, and it is particularly important that this length of tube should be employed when using the oil immersion objectives. If a nose-piece is interposed between the objective and tube, the tube should be drawn out to 160 mm only, as the collar of the nose-piece is 10 mm thick.

The dry lens Nr. 9, and the water immersion Nr. 10, may be had with coverglass adjustment, this addition increasing their prices $ 4. The Apochromatic Nr. 4, of 4 mm focal distance, is sold only with coverglass correction. On the index of these coverglass adjustments the numbers 0,10, 0,15, and 0,20 mm refer to the thickness of the coverglass, the intermediate gradations being indicated by lines only.

Cedar oil, thickened till its index of refraction is 1,515 is used with the oil immersion lenses. A bottle of this accompanies each of these objectives.

Dry and immersion lenses of the same magnification have in general the same angular aperture, but, owing to the various conditions

of their use, there is considerable difference among them as regards numerical aperture and consequently, in their resolving power.

The following table permits a comparison oft the resolving power of lenses of the various series:

$a = n \sin u.$

Angular Aperture $2u$	10^0	20^0	30^0	40^0	50^0	60^0	70^0	80^0	90^0	100^0	110^0	120^0	130^0	140^0
Dry Series $n = 1{,}00$	0,09	0,18	0,26	0,34	0,42	0,50	0,57	0,64	0,71	0,77	0,82	0,87	0,91	0,94
Water Immersion $n = 1{,}33$	0,12	0,24	0,35	0,46	0,56	0,66	0,76	0,85	0,94	1,02	1,09	1,15	1,20	1,25
Oil Immersion $n = 1{,}52$	0,14	0,26	0,40	0,52	0,64	0,76	0,87	0,98	1,07	1,16	1,24	1,32	1,38	1,43
Monobromnaphthalin Immersion $n = 1{,}66$	0,15	0,29	0,43	0,57	0,70	0,83	0,95	1,07	1,17	1,27	1,36	1,44	1,50	1,56

Achromatic Objectives.

Number		Focal Distance	Numerical Aperture	Initial Magnification	Price $
Dry Series	1	44mm (1¾")	0,09	5,8	**6.—**
	2	30mm (1¼")	0,14	8,3	**6.—**
	3	18 mm (¾")	0,28	14	**6.—**
	4	10 mm (⅖")	0,45	25	**10.—**
	5	5,8mm (¼")	0,77	43	**10.—**
	6	4,4mm (⅙")	0,82	57	**12.—**
	7	3,2mm (⅛")	0,85	78	**12.—**
	8	2,5mm (1/10")	0,87	100	**16.—**
	9	2,2mm (1/12")	0,87	115	**24.—**
Water Immersion	10	2,4mm (1/10")	1,10	105	**26.—**
Homogeneous Oil Immersion	1/12	2,2mm (1/12")	1,30	115	**40.—**
	1/16	1,7mm (1/16")	1,30	145	**60.—**

Huyghenian Eye-pieces.

Number	O	I	II	III	IV	V
Focal Distance mm	50	40	35	30	25	20
Magnification	5	6	7	8	10	12

Price of each, $ 2.—.

Magnification

of the Achromatic Objectives with the Huyghenian Eye-pieces.

Tube-length 170 mm, Distance of Image 250 mm.

Objectives		Eye-pieces						Objectives	
		0	I	II	III	IV	V		
Dry Series	1	13	16	20	23	28	40	1	Dry Series
	2	25	32	37	45	54	78	2	
	3	45	57	68	80	100	140	3	
	4	57	75	90	110	130	170	4	
	5	145	175	220	250	320	470	5	
	6	180	230	280	310	400	570	6	
	7	250	330	410	480	590	800	7	
	8	325	415	500	560	700	1020	8	
	9	410	520	630	730	920	1280	9	
Water Immersion	10	350	480	580	690	840	1150	10	Water Immersion
Homogeneous Oil Immersion	1/12	400	510	600	700	850	1200	1/12	Homogeneous Oil Immersion
	1/16	500	650	800	1000	1160	1550	1/16	

Pantachromatic Objectives.

Designation		Focal Distance mm	Numerical Aperture	Initial Magnification	Price $
Dry Series	P 34	34	0,12	7,4	**10.—**
	P 15	15	0,32	17	**12.—**
	P 7	7	0,75	36	**18.—**
	P 3	3	0,87	82	**24.—**
Homogeneous Oil Immersion	P 2	2	1,30	125	**64.—**

Magnification

of the Pantachromatic Objectives with the Huyghenian Eye-pieces.

Tube-length 170 mm, Distance of Image 250 mm.

Objectives		Eye-Pieces					
		0	I	II	III	IV	V
Dry Series	P 34	16	20	26	33	40	53
	P 15	50	60	70	85	110	150
	P 7	110	140	170	220	270	330
	P 3	250	320	370	440	550	760
Homogeneous Oil Immersion	P 2	420	550	630	730	950	1350

Apochromatic Objectives.

Designation		Focal Distance mm	Numerical Aperture	Initial Magnification	Price $
Dry Series	16	16	0,30	15,5	**32.—**
	8	8	0,65	31	**40.—**
	4	4	0,95	63	**60.—** with correction collar.
Homogeneous Oil Immersion	2	2	1,35	125	**120.—**

Compensation Eye-pieces

for the Apochromatic Objectives.

Eye-pieces	4	6	8	12	18
Price $	**6.50**	**6.50**	**10.—**	**10.—**	**8.—**

Magnification

of the Apochromatic Objectives and the Compensation Eye-pieces.

Objectives		Eye-pieces 4	6	8	12	18
Dry Series	16	62	93	125	187	280
	8	124	190	250	370	560
	4	250	375	500	750	1120
Oil Immersion	2	500	750	1000	1500	2250

B. The Stand.

Twelve varieties of stand are manufactured by us, which meet all the requirements of the physician and naturalist. The general plan of their construction, the exactness of working of all their parts and the beauty of their finish have made a place for these stands in nearly all the laboratories of the world.

Stand I is an instrument of considerable size, which especially recommends itself on account of the large size of its stage, which admits of the most convenient use of the mechanical stage. Stands Ia and Ib are those usually selected for bacteriological investigations.

Stand II is also all that is required for bacteriological study. It has come to be very widely used as a microscope for students in the courses in microscopy of the largest medical colleges throughout the United States and Germany.

The anatomist, botanist and zoologist finds in Stand III all that is really necessary for the greater part of his work. For the study of yeasts and some other low forms of plant and animal life, however, we recommend the larger stands.

Stands IV and V are smaller instruments suitable for certain special uses where high powers are not essential.

Stand VI has been made with a carefully constructed rack and pinion and a large stage. It is a strong, heavy stand well suited for rough work in laboratories where special examinations are made (as, for example, for trichinae), or as an adjunct to the ordinary laboratory outfit for use in emergencies.

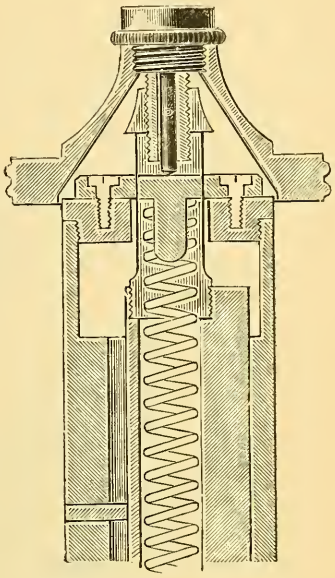
Three stands have been specially constructed to meet the requirements of mineralogical examinations. Two of these are large, of the dimensions of Stands I and Ia and are provided with all the accessories demanded by the science of modern mineralogy.

The third is provided with only such of these as are required for the purpose of polarization.

The **coarse adjustment** is by rack and pinion in the stands I, Ia, Ib, II; by sliding tube in the stands III—V.

Stand VI has only coarse adjustement, by rack and pinion; all other stands have fine adjustment.

The **fine adjustment** is accomplished in all the stands by means of a micrometer screw. In the larger stands this is constructed with particular attention to the elimination of all lateral motion. Its section is depicted in the accompanying drawing. The spindle of the screw is hollow and contains a freely movable steel cylinder whose point transmits the pressure to the spring. The micrometer thread is carefully cut and the screw works freely in either direction, stopping in any position without slipping.



The micrometer screw.

The tube of stands I—IV can be drawn out. All stands have the "society screw".

Stands I, Ia, Ib, II and IIIa are inclinable. Stands IIIb, IV, V and VI are not inclinable.

Stands I, Ia, Ib, II and III are enclosed in mahogany cases provided with a nickelplated handle and so constructed that the microscope stands upright in them.

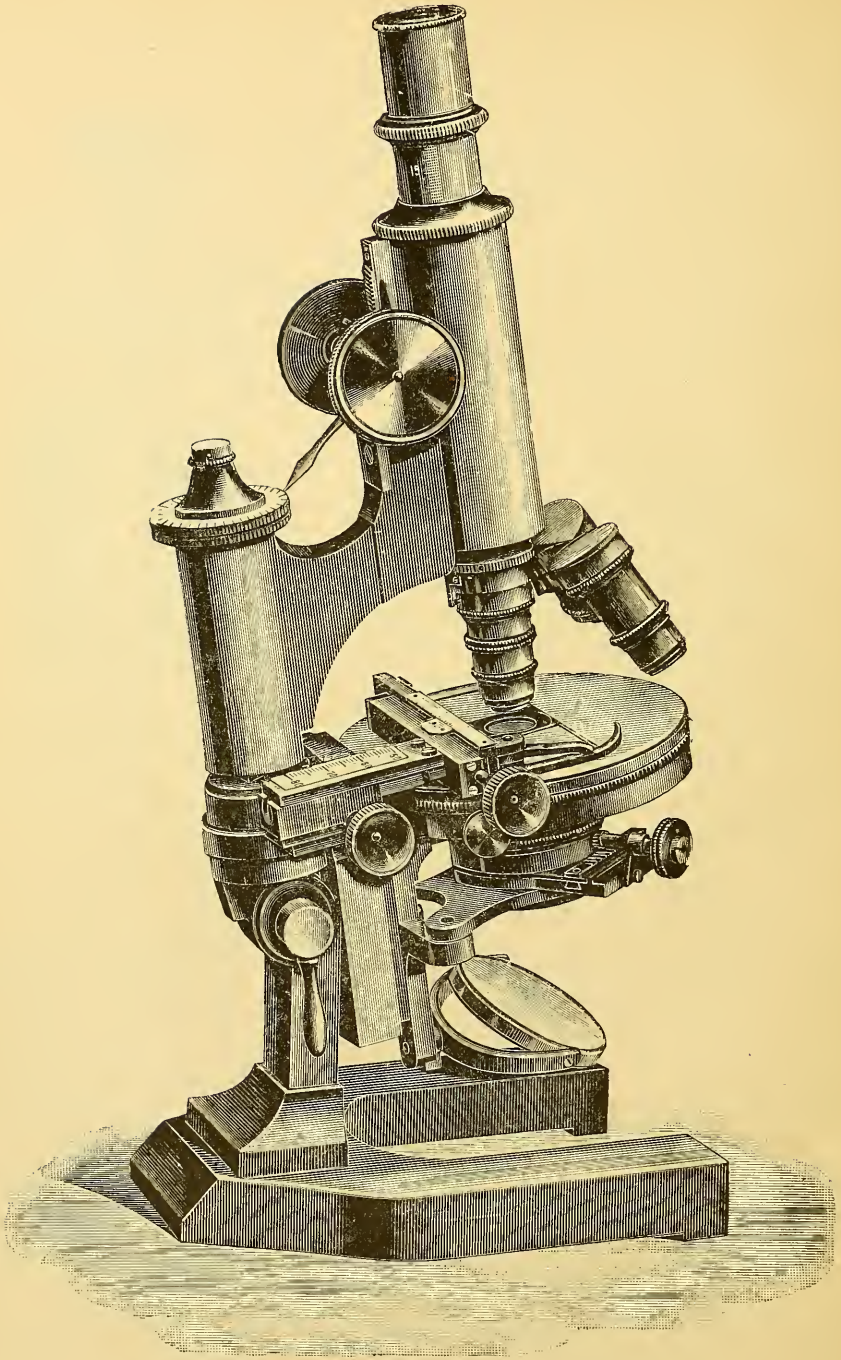
Stands IV, V and VI lie on their sides in smaller mahogany boxes. These mahogany cases are furnished without extra charge with each complets outfit.

Clamps and test objects are included in each outfit.

The objectives provided for Stands I—III are in brass boxes; those for Stands IV—VI in leather boxes.

Three styles of sub-stage **condenser** are furnished. All are provided with the "iris" diaphragm. Only the largest condenser admits of an oblique position of the diaphragm; in the smaller ones the diaphragm has no lateral motion, being attached to the condenser proper. The small sub-stage condenser can be adjusted to any of the smaller stands which are provided with an ordinary cylindrical diaphragm. (A more detailed description of these condensers will be found on p. 44.)

In what follows, the various outfits with the exception of No. 1, are made up with the most carefully corrected achromatic lenses which are abundantly sufficient for almost every purpose. Should the purchaser, however, desire others they will be supplied. In this case the cost of the entire purchase may be estimated by summing up the cost of the individual items.



Stand I.

Stand I.

Nr. $

1. **Large microscope,** inclinable, and with a round revolving and centering stage.

Coarse adjustment by rack and pinion; fine adjustment by micrometer screw, the head of which is provided with a scale for measuring the degree of its revolution; draw-tube with millimeter scale; Abbe condenser with iris diaphragm, with rack and pinion to raise lower the entire sub-stage, and with centering screws. The condenser may be readily removed to make place for the ordinary cylindrical diaphragm.

Mechanical stage Nr. 83 (see cut on page 56). The movements of this stage are accomplished by means of the screws A and B, and are at right angles to one another. The movement from behind forwards is through 30 mm, that from side to side, through 50 mm. The clamps &c., for holding the slide are arranged for slides of the English form (3 inches to 1 inch), but may readily be adjusted for wider or shorter slides. The mechanical stage is fastened to the ordinary stage of the microscope by means of a bar and screw C; it can thus be readily attached to or removed from the microscope and fits so accurately that it always occupies the same place when readjusted, making it possible to readily find any marked place in a specimen.

Triple nose-piece; camera lucida after Abbe; polarisation apparatus Nr. 84:

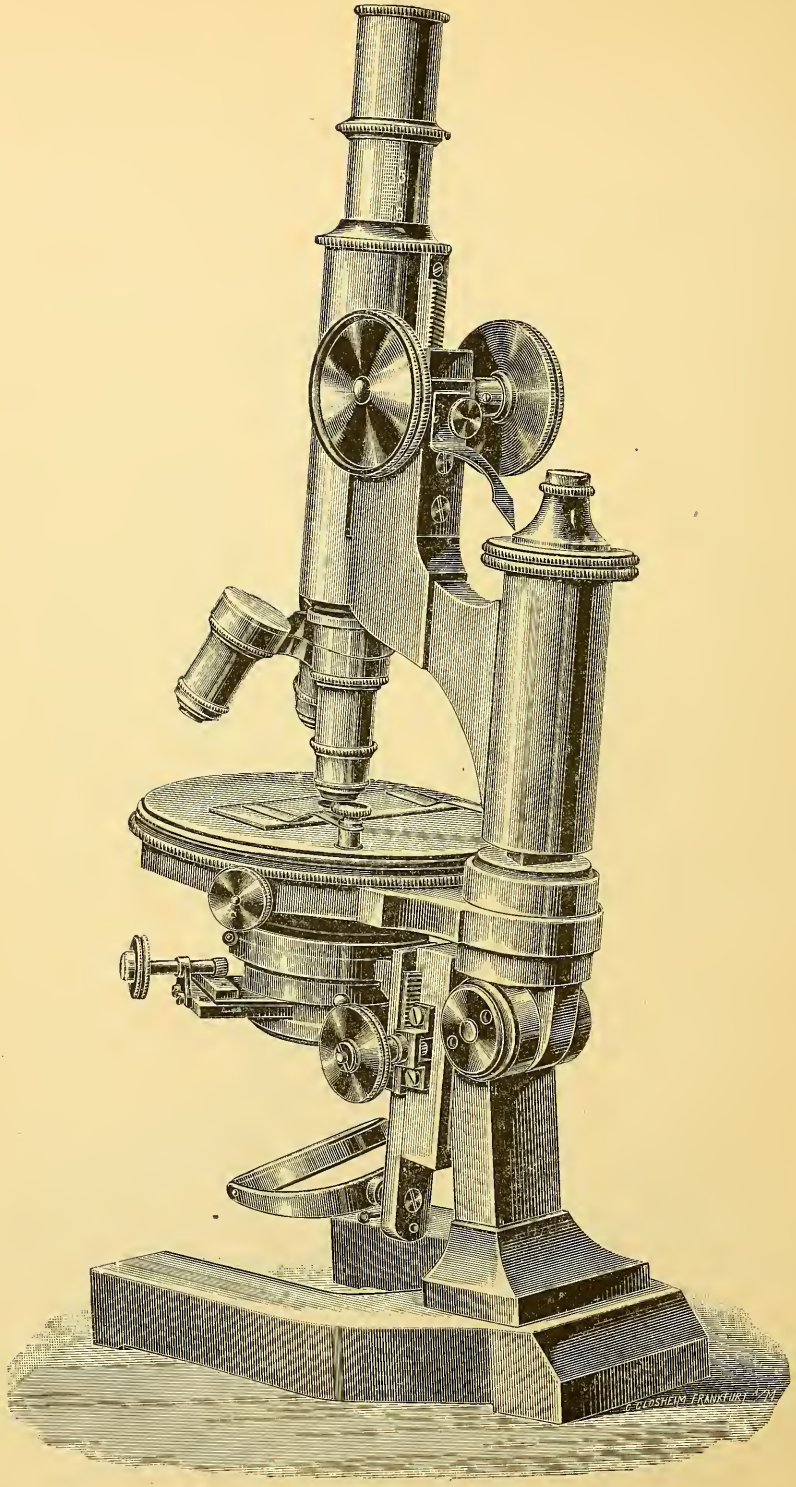
Objectives: Pantachromatic P 34, P 15, P 7, P 3; Apochromatic 2 mm N. A. 1.35.

Eye-pieces: I, III, IV, V; Compensation Eye-pieces 8, 12 and 18. Micrometer Eye-piece II. Stage micrometer Nr. 62.

Condensers of numerical aperture 1.40 and 1.20.

Magnification from 20 to 2250 . . . . . **400.—**

The **stand,** as described above, with mechanical stage, Abbe condenser and triple nose-piece, but without objectives or eye-pieces . . . . . **140.—**



Stand I.

Stand I.

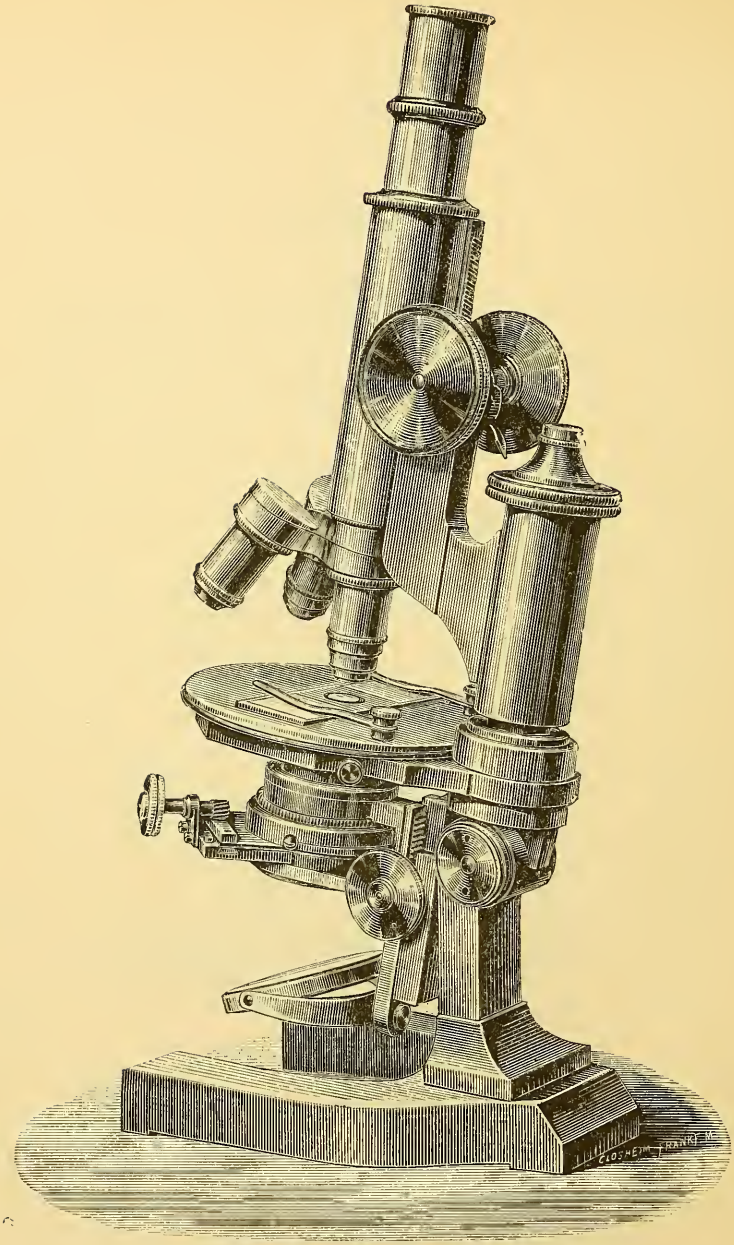
Nr. $

2. **Large microscope,** inclinable, round revolving and centering stage serving nearly all the purposes of the mechanical stage; coarse adjustment by rack and pinion, fine adjustment by micrometer screw with degree scale on milled head; draw tube with millimeter scale; Abbe condenser with iris diaphragm and rack and pinion. Triple nose-piece, eye-piece micrometer, camera lucida after Abbe.
   Objectives 2, 4, 7 and oil immersion $^1/_{12}$, N. A. 1.30.
   Eye-pieces I, III, IV and V.
   Magnification from 32 to 1200 . . . . . **202.—**

3. **The same** with Abbe condenser and iris diaphragm.
   Eye-piece micrometer and triple nose-piece.
   Objectives 1, 3, 7 and oil immersion $^1/_{12}$, N. A. 1.30.
   Eye-pieces I, III and IV.
   Magnification from 16 to 850 . . . . . **184.—**

Stand I, including Abbe condenser, but without objectives, eye-pieces or nose-piece . . . . . **104.—**

The mechanical stage Nr. 83 is adjustable to this stand . **28.—**



Stand Ia.

(With round centering stage.)

Stand Ia.

Nr. $

4a. **Large microscope,** but somewhat smaller than Stand I, inclinable, revolving and centering stage; coarse adjustment by rack and pinion, fine adjustment by micrometer screw with graduated head; draw tube with millimeter scale; Abbe condenser with iris diaphragm and rack and pinion for raising and lowering. The ordinary cylinder diaphragm is readily adjusted by simply turning aside the iris diaphragm and slipping out the condenser. Triple nose-piece.

Objectives 2, 4, 7 and oil immersion $^1/_{12}$, N. A. 1.30.

Eye-pieces I, III, IV and V.

Magnification from 32 to 1200 . . . . . **160.—**

4b. **The same.**

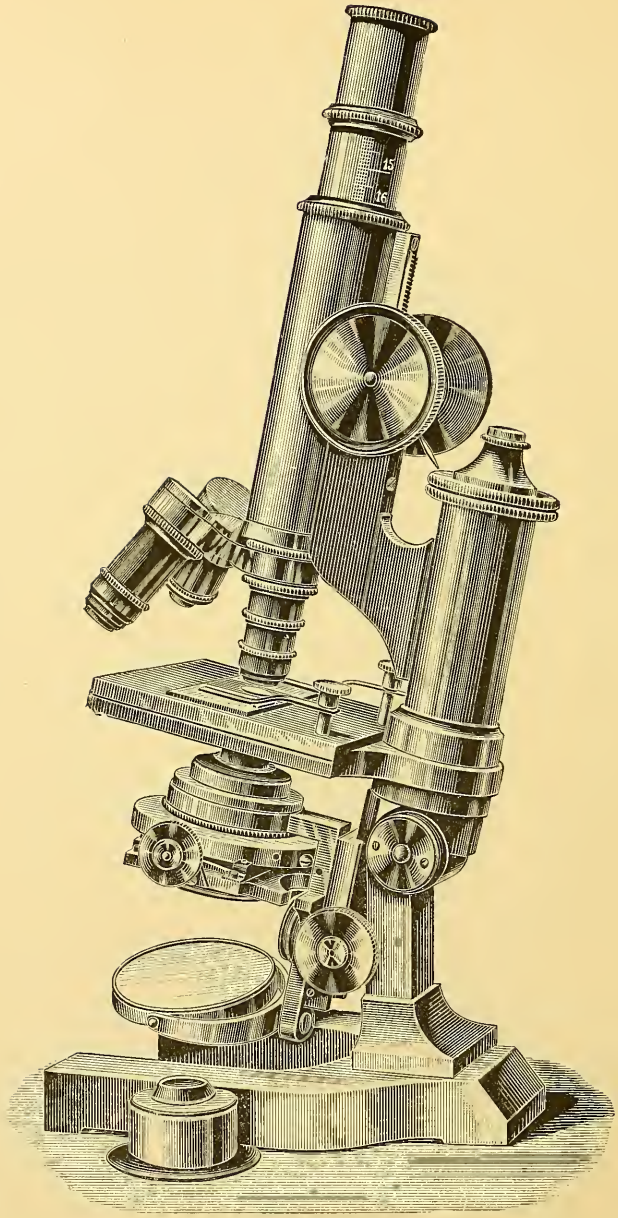
Objectives 3, 7 and oil immersion $^1/_{12}$, N. A. 1.30.

Eye-pieces I, III and IV.

Magnification from 57 to 850 . . . . . **148.—**

Stand Ia, as described above, including Abbe condenser, but without objectives, eye-pieces or nose-piece . . . **76.—**

The mechanical stage Nr. 83 is adjustable to this stand . **28.—**



Stand Ib.

With fixed stage.)

Stand Ib.

Nr. $

5. **Large microscope** with fixed stage, inclinable; coarse adjustment by rack and pinion, fine adjustment by micrometer screw with graduated head; draw tube with millimeter scale; Abbe condenser as in Nr. 4; triple nose-piece.
   Objectives 3, 7 and oil immersion $^1/_{12}$, N. A. 1,30.
   Eye-pieces I, III and IV.
   Magnification from 57 to 850 . . . . . **142.—**

6. **The same,** but without nose-piece.
   Objectives 3, 7 and oil immersion $^1/_{12}$, N. A. 1,30.
   Eye-pieces I and III.
   Magnification from 57 to 700 . . . . . **132.—**

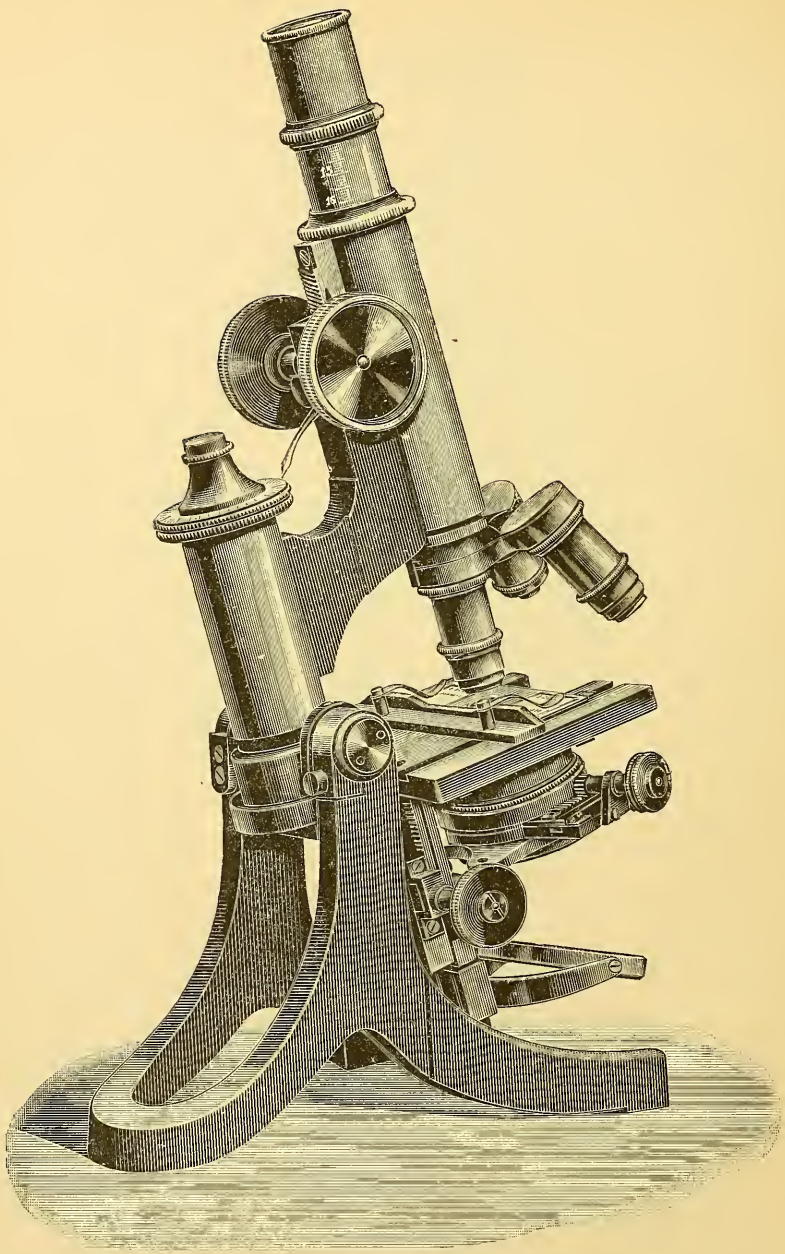
7. **The same,** but without Abbe condenser and without millimeter scale on draw-tube. With double nose-piece and ordinary cylinder diaphragm.
   Objectives 3 and 7.
   Eye-pieces I and III.
   Magnification from 57 to 480 . . . . . **72.—**

8. **The same** as Nr. 7, but without nose-piece . . . . . **66.—**

Stand with fixed stage and graduated draw-tube, but without objectives or eye-pieces, and without Abbe condenser or nose-piece . . . . . **46.—**

Nrs. 7 and 8 are furnished with the ordinary plane and concave mirror, movable vertically and from side to side.

Sliding rule for examining exactly sections of great dimensions can be fastened on the border of the stage . . **2.—**



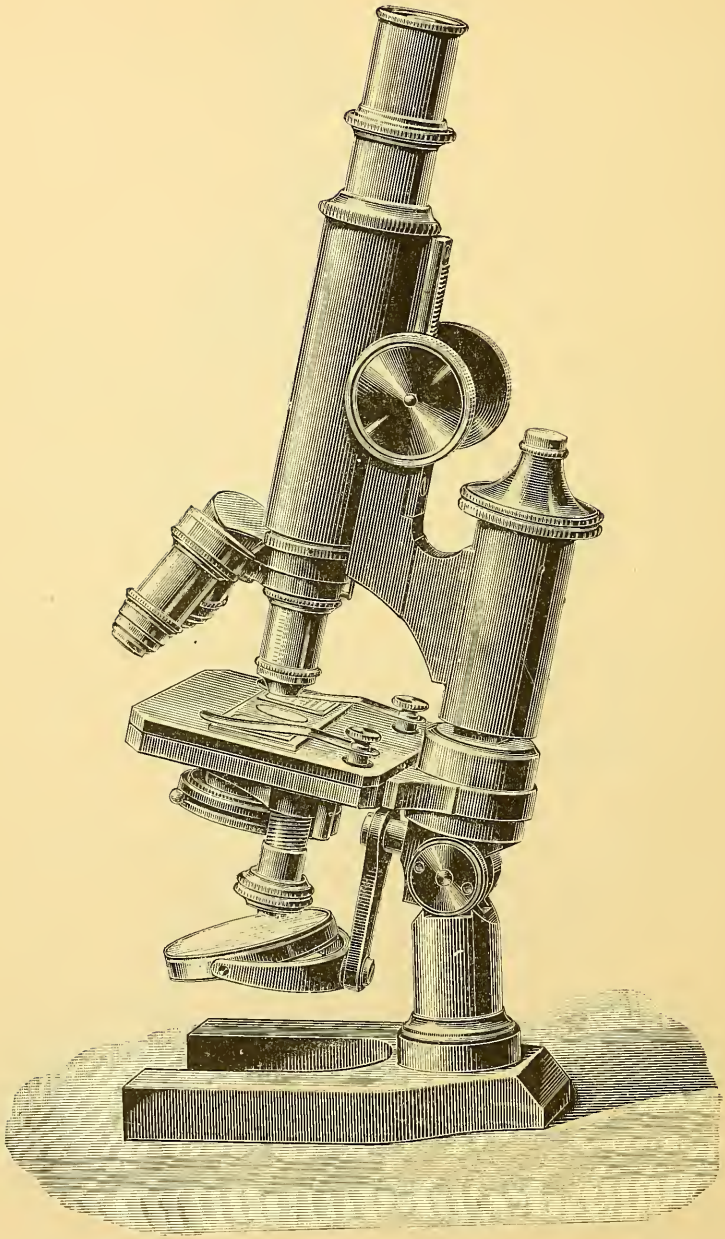
Stand Ib

with english foot.

Stand Ib

with english foot.

Nr.		$
5e.	**Large microscope** with fixed stage and sliding-bar, inclinable; coarse adjustment by rack and pinion, fine adjustment by micrometer screw with graduated head; draw tube with millimeter scale; Abbe condenser as in Nr. 4; triple nose-piece. Objectives 3, 7 and oil immersion $^1/_{12}$, N. A. 1,30. Eye-pieces I, III and IV. Magnification from 57 to 850	**142.—**
6e.	**The same,** but without nose-piece. Objectives 3, 7 and oil immersion $^1/_{12}$, N. A. 1,30. Eye-pieces I and III. Magnification from 57 to 700	**132.—**
	Stand Ib with english foot, Abbe condenser and iris diaphragm, without objectives, eye-pieces or nose-piece	**70.—**



Stand II.

Stand II.

Nr. $

9. **Medium size microscope,** inclinable; coarse adjustment by rack and pinion, fine adjustment by micrometer screw; Abbe condenser of simpler construction (see Nr. 34, p. 44) with iris diaphragm and hung on a perpendicular screw by which it may be raised and lowered. This condenser is easily changed for the ordinary cylinder diaphragm. Triple nose-piece.
Objectives 3, 7 and oil immersion $^1/_{12}$, N. A. 1,30.
Eye-pieces I, III and IV.
Magnification from 57 to 850 . . . . . **120.—**

10. **The same,** with the Abbe condenser as in Nr. 9, without nose-piece.
Objectives 3, 7 and oil immersion $^1/_{12}$, N. A. 1,30.
Eye-pieces I, III and IV.
Magnification from 57 to 850 . . . . . **112.—**

11. **The same,** with the Abbe condenser as in No. 9, without nose-piece.
Objectives 3, 5 and 7.
Eye-pieces I and III.
Magnification from 57 to 480 . . . . . **80.—**

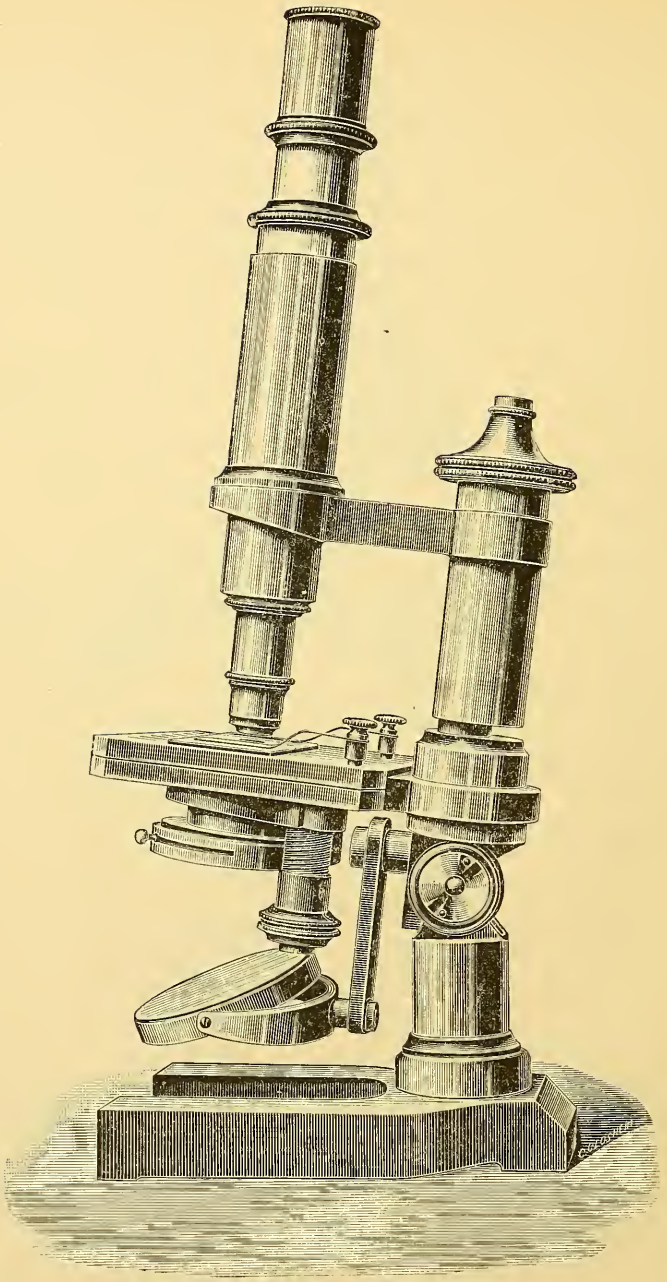
12. **The same,** without Abbe condenser or nose-piece.
Objectives 3, 6 and 8.
Eye-pieces I and III.
Magnification from 57 to 560 . . . . . **74.—**

13. **The same,** without condenser or nose-piece.
Objectives 3 and 7.
Eye-pieces I and III.
Magnification from 57 to 480 . . . . . **58.—**

Stand II, with Abbe condenser and iris diaphragm without objectives and eye-pieces . . . . . **48.—**

Stand II, with ordinary cylinder diaphragm and without objectives or eye-pieces . . . . . **36.—**

Nr. 12 and 13 are furnished with the ordinary plane and concave mirror with vertical and lateral movement.



Stand IIIa.

Stand IIIa.

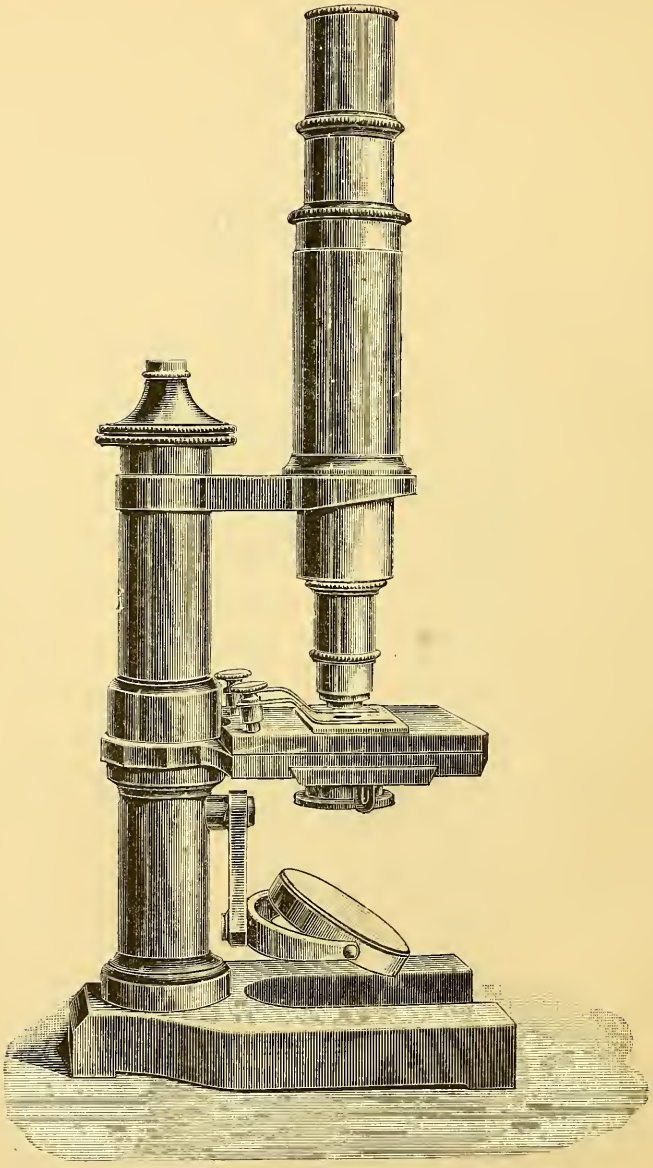
Nr. $

14. **Medium size microscope,** inclinable; coarse adjustment by sliding tube, fine adjustment by micrometer screw; Abbe condenser of simpler construction with iris diaphragm, with the same arrangement for raising and lowering the condenser as stand II. The ordinary cylinder diaphragm is easily interchangeable with the Abbe by simply screwing the latter down and turning it aside. The usual plane and concave mirror, movable from side to side for oblique illumination. Double nose-piece.

Objective 3, 7 and oil immersion $^1/_{12}$, N. A. 1,30.
Eye-pieces I and III.
Magnification from 57 to 700 . . . . . **106.—**

The **stand,** with the Abbe condenser and iris diaphragm, but without objectives, eye-pieces or nose-piece . . . . . **38.—**

The **stand** alone, without condenser . . . . . **26.—**



Stand IIIb.

(Not inclinable.)

Stand IIIb.

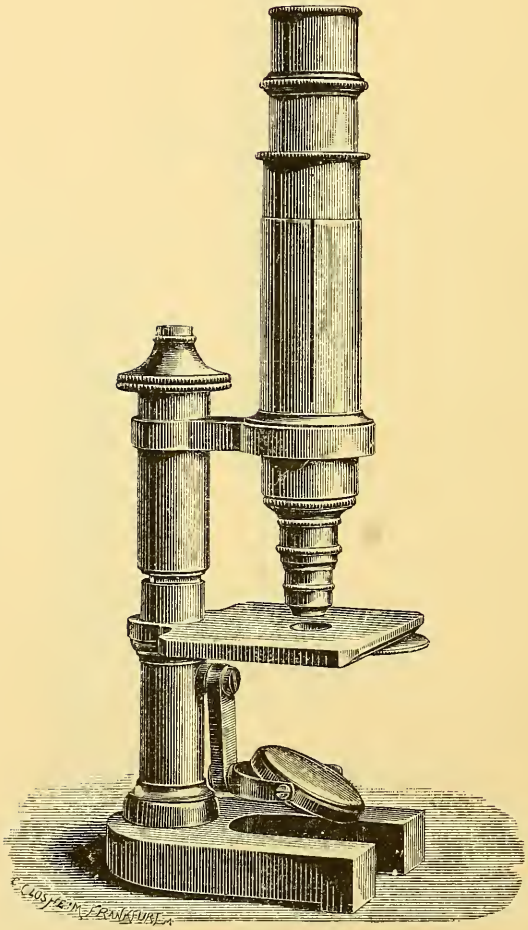
Nr. $

15. **Medium size microscope,** not inclinable; with small Abbe condenser (see Nr. 35, p. 44). Adjustments by sliding tube and micrometer screw.
    Objectives 3, 7, oil immersion $^1/_{12}$, N. A. 1,30.
    Eye-pieces I and III.
    Magnification from 57 to 700 . . . . . **92.—**

16. **The same,** without Abbe condenser.
    Objectives 3, 6 and 8.
    Eye-pieces I and III.
    Magnification from 57 to 560 . . . . . **60.—**

17. **The same.**
    Objectives 3 and 7.
    Eye-pieces I and III.
    Magnification from 57 to 480 . . . . . **44.—**

The **stand** alone without objectives or eye-pieces . . . . **22.—**



Stand IV.

Stand IV.

Nr. $

18. **Small microscope.** Adjustments by sliding tube and micrometer screw. Ordinary cylinder diaphragm. Concave and plane mirror, swinging for oblique illumination.
Objectives 3, 6 and 8.
Eye-pieces I and III.
Magnification from 57 to 560 . . . . . **50.—**

19. **The same.**
Objectives 3 and 7.
Eye-pieces I and III.
Magnification from 57 to 480 . . . . . **36.—**

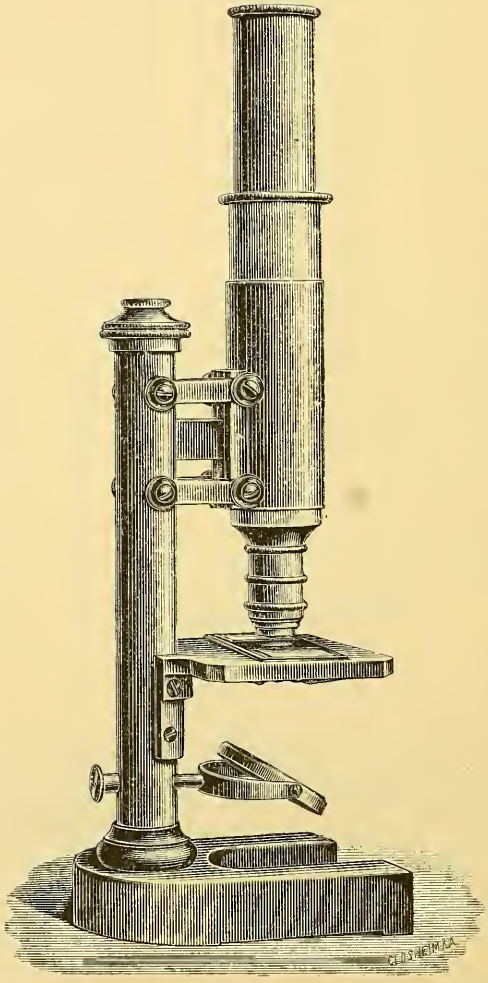
20. **The same,** but with rotating disc-diaphragm in place of the cylinder diaphragm.
Objectives 3, 5 and 7.
Eye-pieces I and III.
Magnification from 57 to 480 . . . . . **42.—**

21. **The same.**
Objectives 1, 3 and 7.
Eye-pieces I and III.
Magnification from 16 to 480 . . . . . **40.—**

22. **The same.**
Objectives 3 and 7.
Eye-pieces I and III.
Magnification from 57 to 480 . . . . . **34.—**

The **stand** with cylinder diaphragm, without objectives or eye-pieces . . . . . **14.—**

The **stand** with rotating diaphragm, without objectives or eye-pieces . . . . . **12.—**



Stand V.

Stand V.

Nr. $

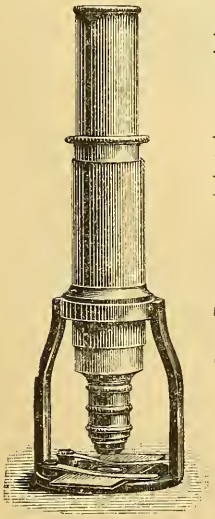
23. **Small microscope.** Adjustments by sliding tube and micrometer screw. Concave mirror.
Objectives 3 and 7.
Eye-pieces I and III.
Magnification from 57 to 480 . . . . . **28.—**

24. **The same.**
Objectives 3 and 5.
Eye-pieces I and III.
Magnification from 57 to 250 . . . . . **26.—**

25. **The same,** plane mirror.
Objectives 1 and 3.
Eye-pieces I and III.
Magnification from 16 to 80 . . . . . **24.—**

26. **The same.**
Objective 3.
Eye-pieces I and IV.
Magnification from 57 to 100 . . . . . **18.—**

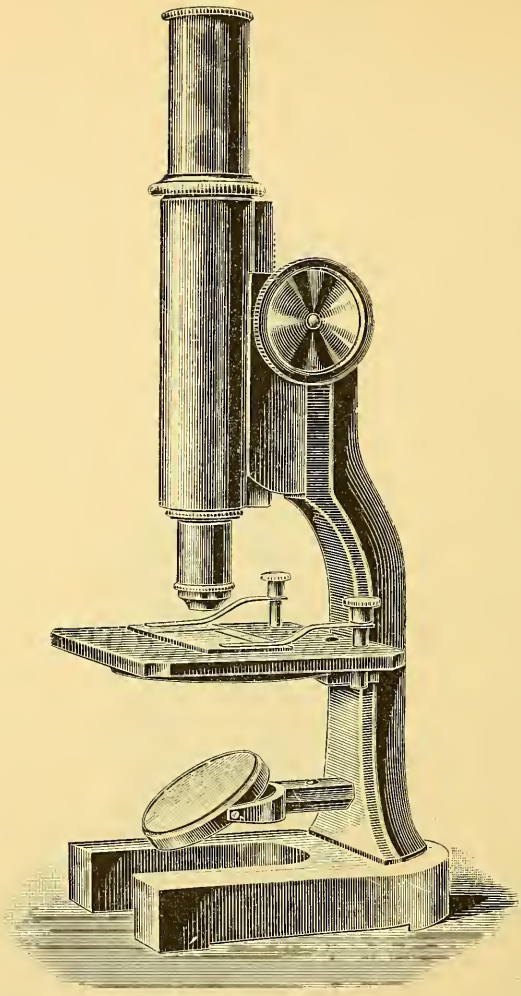
The **stand** alone, without objectives or eye-pieces . . . . **8.—**

27. 

Demonstration microscope.

So arranged that the specimen may be clamped in and the whole passed from hand to hand for purposes of demonstration.
Objective 3..
Eye-piece I . . . . . **12.—**

This **stand** alone, without the objective or eye-piece . . . . . **5.—**



Stand VI.

Nr.		$
28.	**Strong Laboratory Stand** suitable for examinations for trichinae etc. Has unusually large stage (90 to 100 mm); fine adjustment by means of a very carefully constructed rack and pinion, which makes possible the accurate focus of even high power objectives.	
	Stand without objectives, eye-pieces or box	**8.—**
	Glass compressor with graduations	**1.25**
29.	This stand, fitted with objective 3, eye-pieces I and IV. (Magnification 57 to 100) in Mahogany box	**18.—**

C. Microscopes
for Mineralogical Examinations.

Three forms of stands are constructed for mineralogical investigations. All are intended to furnish the data for the determination of the axis of elasticity and for the differentiation of isotropic and anisotropic media; but for the determination of optical axes and their angles Stands I and II are alone applicable.

In the mineralogical outfits only such objectives, condensers and eye-pieces are furnished as have been proved by careful examination by polarized light to be free from all polarizing influence.

Mineralogical Stand I.

Nr.

30. This stand corresponds in dimensions to the large stand Nr. I described above. The coarse adjustment is by rack and pinion, the fine adjustment is by a micrometer screw, the milled head of which has 50 divisions, each of which represents an elevation of one hundredth of a millimeter. The instrument is provided with an Abbe condenser, iris diaphragm and polarizer which may be raised and lowered by rack and pinion.

The condenser has an aperture of 1.40, enabling the easy observation of the axis lines. It is so arranged that it may be readily replaced by the ordinary cylinder diaphragm by simply turning the iris diaphragm to one side.

Exact centering of all combinations of eye-pieces and objectives is accomplished by means of a small movable collar interposed between objective and tube, provided with two thumb-screws, which serve to bring the axis of the optical system into accord with the centre of the revolving stage. The revolving stage is graduated at its edge into

Nr. S

360 degrees which permits of the measurement of angles by means of an index.

A Nicols' prism, serving as a polarizer, fits under the iris diaphragm. Its zero is indicated by a line, as are also the angles 90°, 180° and 270°. — The analyser is mounted in metal and fits easily over the eye-piece. The upper portion of the analyser rotates on a graduated disc, whose circumference is graduated into 360 degrees. A slit just below this disc admits of the introduction of plates of Quartz, Gypsum mica &c. at an angle of 45° to the axis of the analyser.

Another opening in the front of the microscope tube, covered by a movable slide, serves for the introduction of a Bertrand lens, the purpose of which is to greatly magnify the interference figures of the polarized light. The inner tube, carrying the Bertrand lens and the eye-piece may be raised and lowered by means of rack and pinion.

For some examinations an analyser introduced into the body of the tube is to be preferred to that above described, for the introduction of which another opening has been left.

The following articles are furnished to complete this stand:

Eye-piece O, with quartz disc and cross-lines after Bertrand.

Eye-piece I, with cross-lines.

Brezina's Calc-spar-plate, ground perpendicular to its axis, and arranged to fit over eye-piece I.

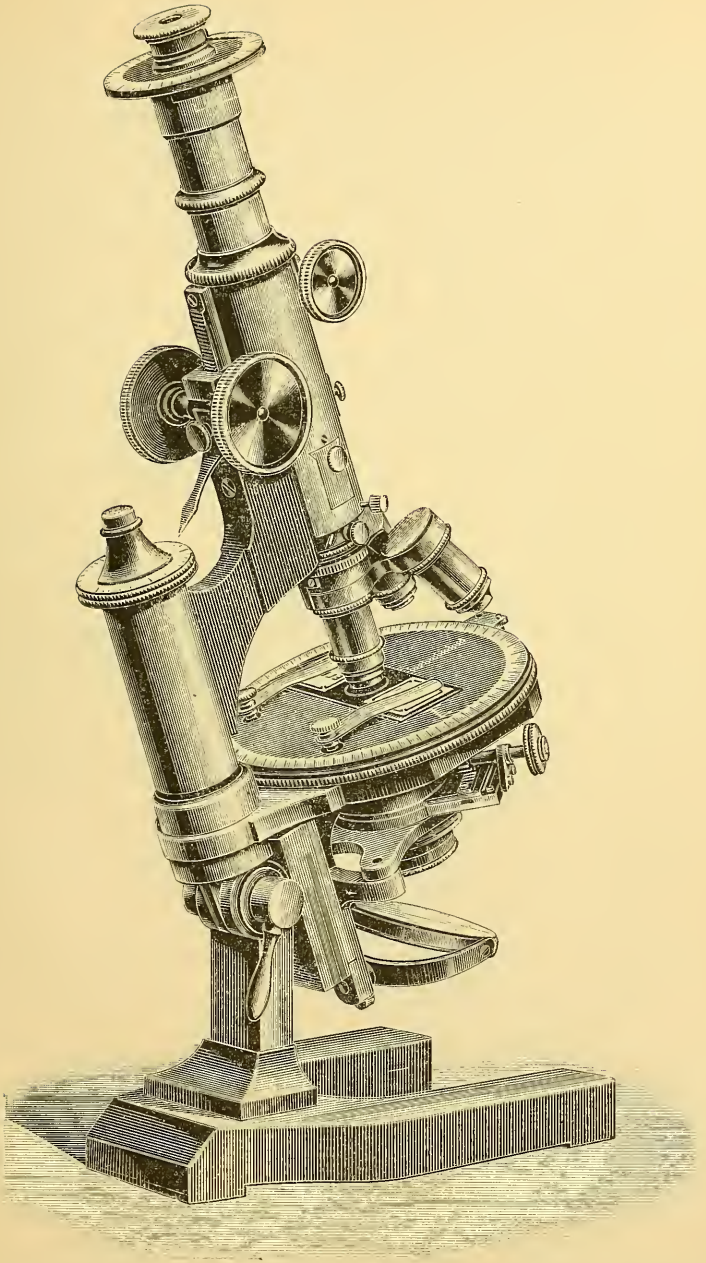
Gypsum and Quartz plates after Klein, for insertion into the opening over the objective.

Price of the stand as above with the accessories . . . . **184.—**

The same with Eye-piece III and
Objectives 1, 3, 5, 7 and oil immersion $^1/_{12}$
Magnification from 13 to 700 . . . . . **260.—**

For search through large sections and for systematic examinations of serial sections the new mechanical stage (Nr. 83, page 56) will be found very useful.

Price . . . . . **28.—**



Mineralogical Stand I.

Mineralogical Stand II.

Nr. $

31. Although in some particulars somewhat simpler than the foregoing microscope and somewhat smaller in size, this instrument serves the same purposes with accuracy. The description of the coarse and fine adjustments, of the condenser and iris diaphragm just given apply equally to the corresponding parts of this stand.

The exact centering of the object for different combinations of eye-pieces and objectives is accomplished in this stand, however, by centering the stage which is movable and is controlled by two thumb screws as its sides. The stage also revolves, and is graduated into 360 degrees, marked by an index.

The polarizer and analyser are the same as those for Stand I, and fit in the same way.

The Bertrand lens fits into the tube like an ordinary eye-piece, and may be focussed by a draw-tube arrangement, not by rack and pinion as in Stand I.

The following accessories are necessary to the stand and are furnished with it:

Eye-piece I with cross-lines.

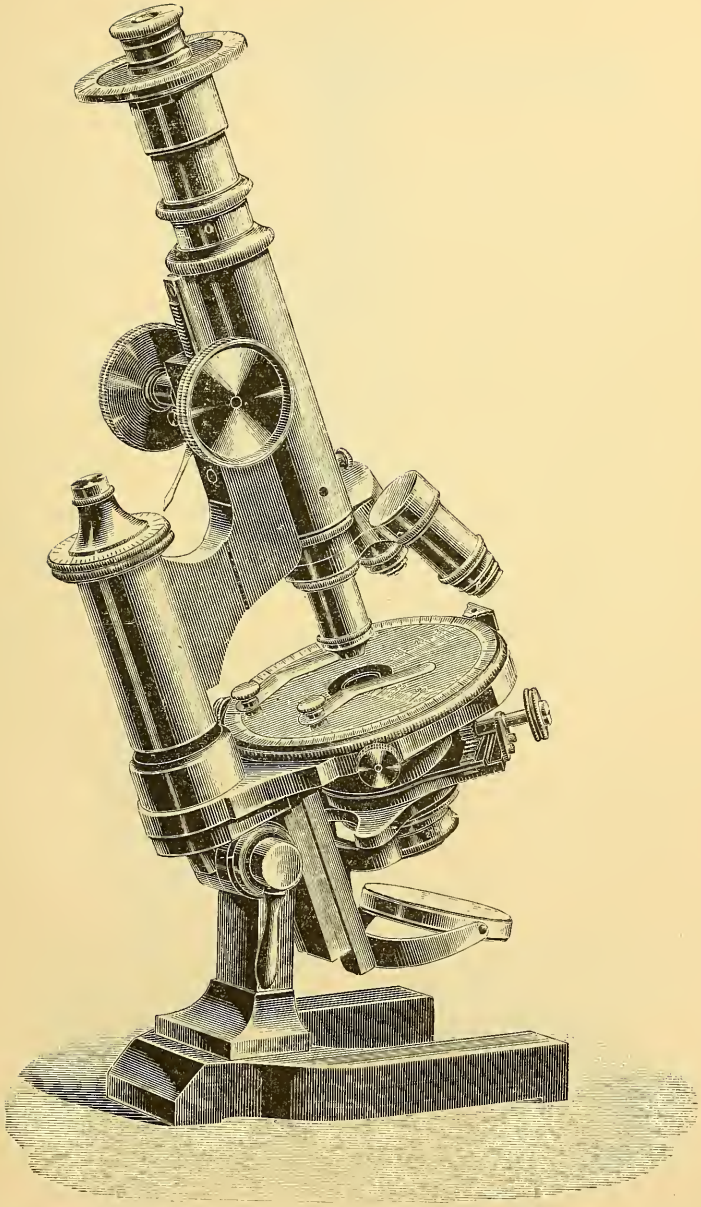
Gypsum and quartz plates after Klein, for insertion over the objective.

Brezina calc-spar plate, ground perpendicular to the axis, to be fitted over eye-piece I.

Price of the stand as above, with accessories . . . . . **120.—**

The same, with Eye-piece III,
Objectives 3 and 7,
Magnification from 57 to 480 . . . . . **140.—**

The mechanical stage (Nr. 83, page 56) may readily be fitted to this Stand.



Mineralogical Stand II.

Mineralogical Stand III.

Nr. $

32. The tube is mounted upon a heavy iron foot and upright and is movable by rack and pinion only, the accurate construction of which nevertheless admits of the focussing of the higher powers. The stage revolves and is centred by side screws as in Stand II. The circumference of the stage is graduated into 360 degrees, indicated by an index.

The polarizer fits into the diaphragm holder, in which it is firmly held by a thumb screw.

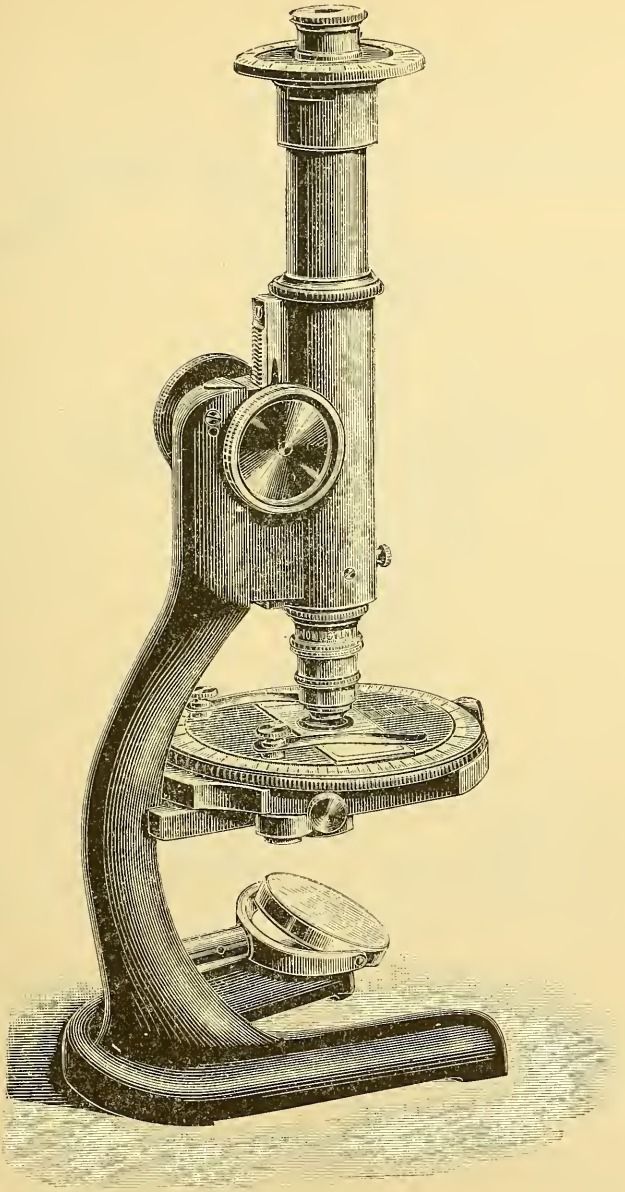
The analyser is the same as that for the other two stands, and has under its collar a slit for the introduction of the gypsum and mica plates.

Just above the objective another slit admits the quartz and gypsum plates.

Price of this microscope, with
Eye-piece I with cross-lines,
Quartz plate after Klein and a gypsum plate . . . . **40.—**

The same with Eye-piece III,
Objectives 3 and 6,
Magnification from 57 to 310 . . . . . **60.—**

A special catalogue has been issued devoted to microscopes for mineralogical examinations.



Mineralogical Stand III.

D.

Illuminating Apparatus.

Nr. $

33. **The large Abbe condenser** consists of three parts:

(a) the condenser proper, of high power,
(b) the diaphragm carrier with the iris diaphragm,
(c) the plane and concave mirror.

After turning aside the diaphragm carrier the ordinary cylinder diaphragm may be substituted for the condenser. The aperture of the iris diaphragm is regulated by a small knob. The opening may be completely closed. The exentric adjustment of the diaphragm is obtained by rack and pinion, and is so arranged that oblique illumination is easily possible in any direction.

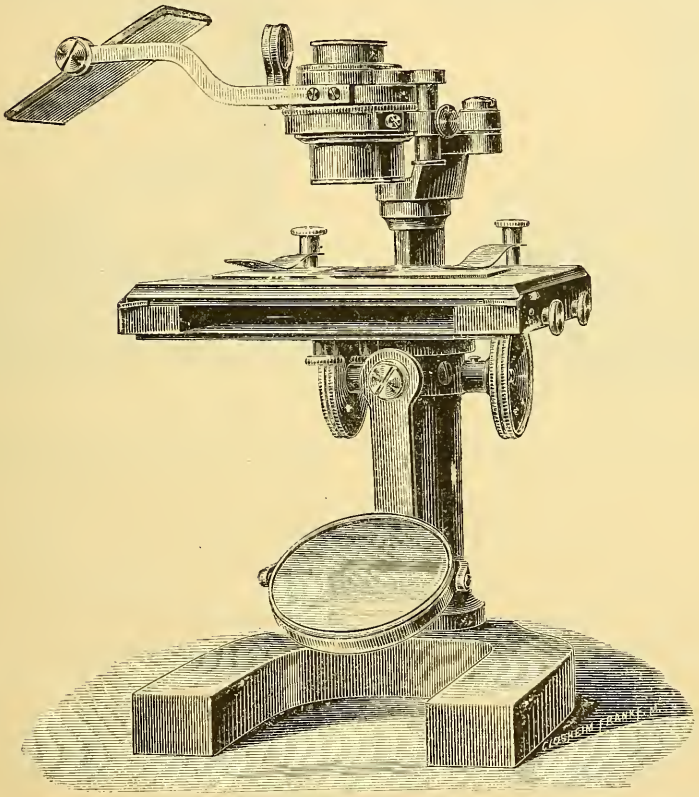
A rack and pinion adjustment of the whole substage serves to raise and lower it to any required degree, thus permitting the most advantageous concentration of light upon the object.

This large illuminating apparatus is designed for Stands I, Ia and Ib . . . . . **24.—**

34. **The medium size Abbe** has the same condenser as the large but the iris diaphragm is fixed and so cannot be adjusted for oblique illumination. The whole is raised and lowered by means of a screw, not by rack and pinion. The substitution of the ordinary cylinder diaphragm for the condenser is very easily accomplished. This condenser is designed for Stands II and III . . . . . **12.—**

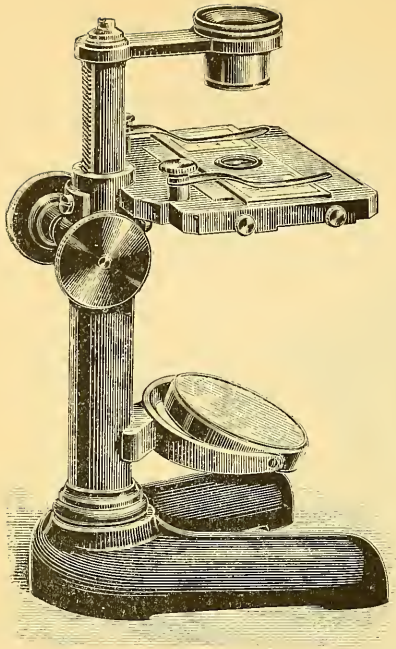
35. **The small illuminator** is less powerful and has a smaller iris diaphragm, both of which are fixed. The apparatus is made to slip easily into the collar for the ordinary cylinder diaphragm. It is adjustable to Stands III and IV when these are provided with the usual cylinder diaphragm . . **8.—**

E. Dissecting Microscopes and Hand Lenses.

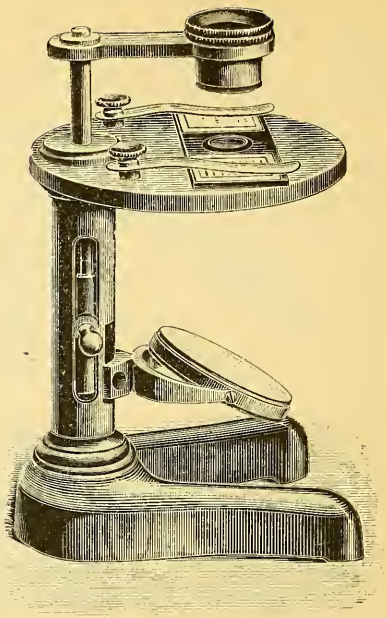


Large Dissecting Microscope, Nr. 36.

Nr.		$
36.	**Large dissecting microscope** with heavy horse-shoe base and large stage. Adjustment by rack and pinion. The lens-carrier is movable from side to side and may be elongated. Movable plane and concave mirrors. Three aplanatic Steinheil lenses of 8, 16 and 20 diameters magnification. Drawing apparatus after Abbe, which may be removed when not in use, Hand-rests	40.—
37.	**The stand** as above described, without the drawing apparatus and without the lenses	16.—



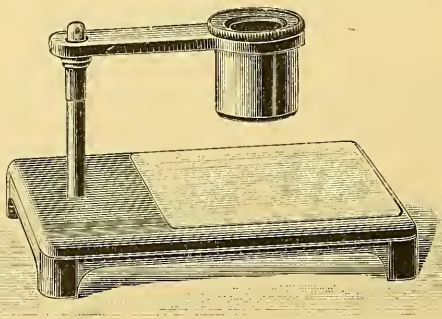
Dissecting Microscope Nr. 38.



Dissecting Microscope Nr. 40.

Nr.		$
38.	**Smaller dissecting microscope.** Adjustment by rack and pinion. Movable plane mirror and white glass plate. Stage of glass, set in a metal frame. Two aplanatic Steinheil lenses of 10 and 20 diameters magnification. Hand-rests .	**15.50**
39.	**The stand** alone, without lenses	**7.25**
40.	**Smaller Dissecting Microscope.** Sliding adjustment. Brass stage; no hand rests. Two achromatic doublets 8 and 10 diameters magnification	**10.50**
41.	**Stand alone,** without the lenses	**5.—**
42.	**Preparation stage,** with white glass plate and sliding lens-holder. Simple lens of 6 diameters magnification	**2.50**

Nr. 42.



Nr. 42.

43.	**Stand for lens.** A heavy iron foot supporting an upright on which an arm for carrying a lens is adjustable by rack and pinion. Without lenses	**5.—**
44.	**Simpler stand for lens.** With arm and ball-and-socket joint, making it adjustable to any position	**3.25**

Steinheil Lenses

remarkable for their plane and sharp pictures.

Nr.	Diameter in mm	Magnification	$
45.	24 mm	8	**4.—**
46.	15 „	10	**4.—**
47.	15 „	16	**4.—**
48.	6 „	20	**4.—**
	Achromatic Doublets.		
49.	20 mm	8	**3.25**
50.	12 „	10	**2.50**
	Simple Lens.		
51.	15 mm	6	**1.25**

52. **Brücke Lens,** low power, 5—10 diameters . . . . . **12.—**

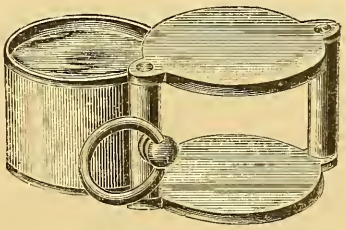
53. **Brücke Lens,** high power, 30—50 diameters . . . . . **8.—**

Both with movable eye lens.

The construction of these lenses is such that they fit any of the lens stands above described, but the higher power Steinheil lenses and the high power Brücke lens are applicable only to those provided with rack and pinion adjustment. The low power Brücke lens is specially constructed to fit stand Nr. 43.

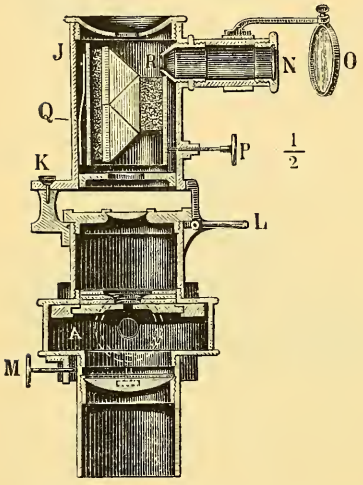
54. The Steinheil lenses Nr. 45—48 are also mounted as **pocket lenses** without additional charge . . . . . **4.—**

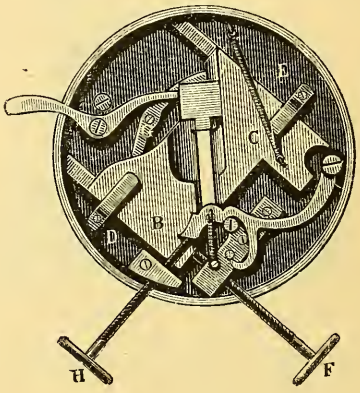
55. **Simple Lens** for the pocket, high power **1.25**



Pocket Lens, Nr. 54.

F. Apparatus
for Measuring and Drawing.





The Microspectroscope.

Nr. $

56. The **Microspectroscope** fits into the tube of the microscope like an ordinary eye-piece and may be fastened in the proper position by means of the thumb-screw M. A scale enables one to exactly locate light and dark lines of the spectrum. The flat drum A, represented in drawing B, contains the slit, regulated by the thumb-screws F and H, and the comparison prism. The lever T moves the comparison prism into position over one half the slit. The Amici prism is contained in the cylinder Q over the eye-piece. At the point N of the horizontal tube RN is the micrometer scale, illuminated by the mirror O. By raising the spring catch L the upper portion of the spectroscope may be rotated around the pivot K, thus allowing of accurate adjustment of the eye-piece . . . . . **66.—**

(A detailed description of the mechanism of this spectroscope accompanies each instrument.)

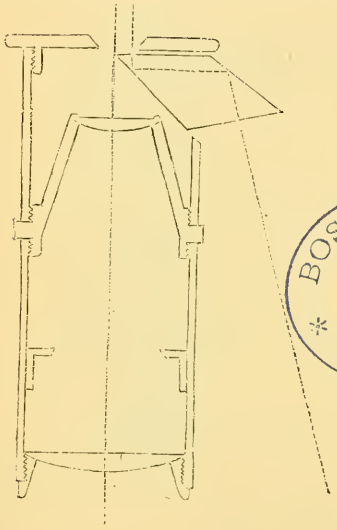
57. **Hand Spectroscope.** For observing the absorption bands of any illuminated object . . . . . **12.—**

Nr.		$
58.	**Micrometer Eye-piece II.** Eye-piece II, in which a collar holding the micrometer scale is screwed. The exact adjustment of the focus of the micrometer scale is made possible by sliding the upper lens of the eye-piece	**5.—**
59.	**Large Eye-piece Micrometer,** for exact measurements. Between the eye-lens and collecting lens of a Huyghenian eye-piece is a millimeter scale etched on glass. Over this there is a movable index, adjusted by means of a revolving drum, so that one revolution of the drum moves the index exactly 0,5 mm; each degree on the graduated scale of the drum representing 0,005 mm motion of the index. An adjustable collar carries the eye lens, thus admitting of its exact focus on the scale. The whole apparatus slips into the tube of the microscope like any ordinary eye-piece, and is then firmly fastened by a thumb-screw	**20.—**
60.	**Glass Micrometer** for the Eye-piece. Constructed to lie on the diaphragm of the eye-piece. Scale of 5 mm divided into 100 parts	**2.50**
61.	**The same.** 5 mm divided into 50 parts	**2.—**
62.	**Stage Micrometer,** Glass, 1 mm divided into hundredths .	**4.—**
63.	**Stage Micrometer,** Photographed on glass, 2 mm divided into 200 parts	**1.40**
64.	**Eye-piece Micrometer,** divided into squares for counting scattered objects in the microscope field. Distance between the lines is 0,5 mm	**2.—**
65.	**Haematometer** after Thoma. Glass plate with cell, and graduated pipette for mixing the blood. (A detailed description of the apparatus accompanies each set)	**11.50**
66.	**Object glass** with cell $^2/_{10}$ mm deep, with eye-piece micrometer Nr. 64, with two ground-edged cover-glasses, in box	**3.60**
67.	**Object glass** with cell the floor of which is divided into small squares ($^1/_{20}$ mm on each side), with two ground-edged cover-glasses, in box.	**4.50**

Nr. $

68. **Prism for reversing** the image of the composed microscope. Fits over the eye-piece, and very materially simplifies manipulation of objects under the microscope . . . . . 8.—

69. **New Camera Lucida Eye-piece.** This fits in the tube of the microscope like an ordinary eye-piece, and is firmly held in place by a screw.



It is in reality an eye-piece with an attached prism.

No adjustment is necessary, the picture appears at once placing the camera lucida in position, is clear and sharp, for the rays pass through the prism without any loss of light.

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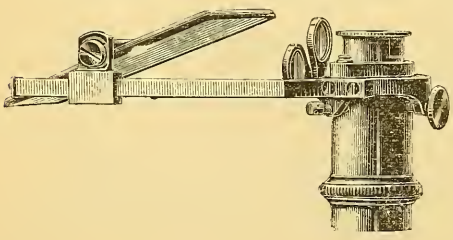
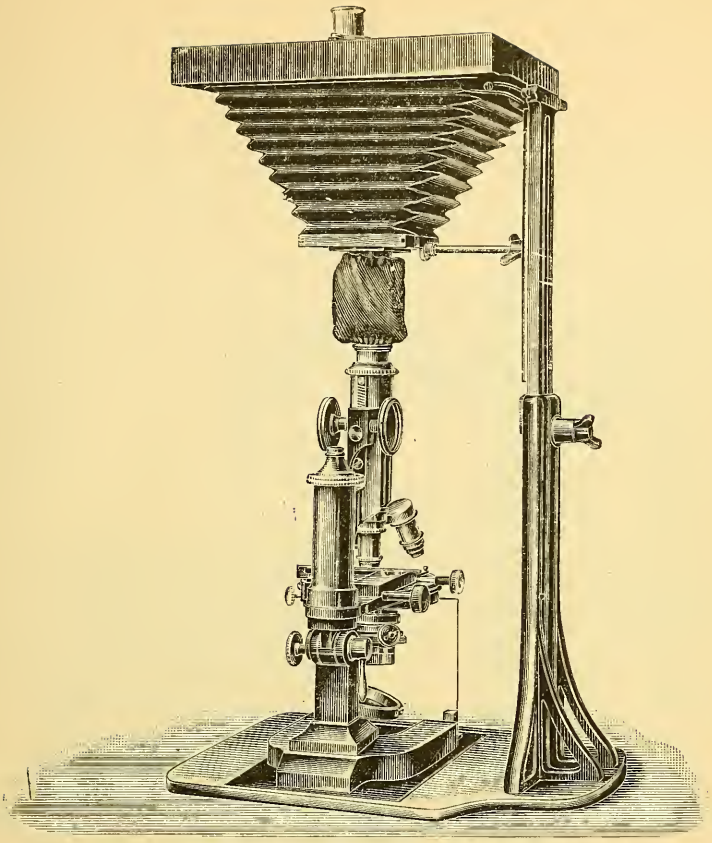
The light may be tempered by introducing a smoked plate of glass just below the lower surface of the prism . . . . . 8.—

70. **Camera Lucida after Abbe.** The drawing paper is reflected by a mirror to a prism which is fitted over the regular eye-piece. The upper portion of the collar containing the prism is so arranged that it may be turned aside, thus permitting the use of the eye-piece without any hinderance . . . . 12.—



71. **The same** attached to eye-piece Nr. I. The prism is thus permanently fixed in the optical axis, and in using the only thing needing adjustment is the mirror. The eye-piece composing this camera lucida is held in place by a lateral screw, which binds it to the tube of the microscope . . . . . 14.—



Photomicrographic Apparatus, Nr. 72.

Nr.		$
72.	The camera is supported on an iron upright which arises from a broad iron base on which the microscope stands. Any form of microscope may be used with this camera, for by adjusting the length of the upright, the camera may be accurately fitted to stands of various heights. A diaphragm in the neck of the camera regulates the size of the field of the image, and the exact focus of the instrument is accomplished by means of a lens at the top of the camera. The plate-holders accommodate plates of the sizes 9 to 12 cm and 13 to 18 cm. The apparatus is provided with two plate-holders, a ground glass plate for the camera, another on a stand for moderating the light of the microscope, and blue and yellow glass discs to fit over the iris diaphragm . .	**40.—**

The method of employing this apparatus and the general technics of photomicrography are treated of in a special pamphlet, which contains six half tones after photographs taken with this apparatus.

No. $

73. **Projection Apparatus** after Edinger. Used for drawing anatomical, embryological and other preparations under a very low power.

A polished wooden stand serves as a drawing board and as a support for an upright holding at its top a horizontal metal cylinder and below this two movable arms for the object and the simple lens. The horizontal cylinder is hollow and contains a condensing lens and a mirror which reflects the light in great intensity vertically downwards through object and lens to the paper on the base. Slight variations in magnification are obtained by changing the relative positions of object and lens. This is accomplished by moving the arm carrying the lens by a rack and pinion. The lamp is supported on a movable base on the side of the upright opposite the lens, &c.

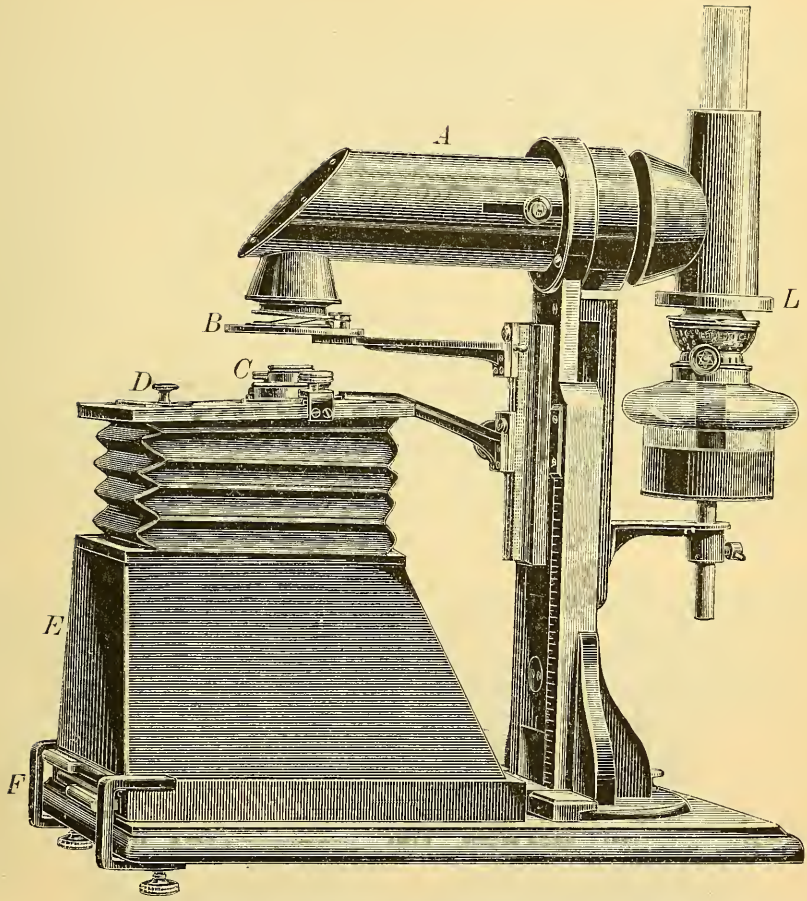
The Apparatus with lamp . . . . . **18.—**

74. Two simple lenses for use with the above apparatus, of 5 and 15 diameters magnification, each $ **4.—** . . . . . **8.—**

75. For photographic purposes this apparatus may be fitted with a camera, diaphragms plate-holders and ground glass plate for an additional cost of . . . . . **20.—**

76 a. Photographic objective of 8 diameters magnification with iris-diaphragm . . . . . **12.—**

76 b. Photographic objective of 16 diameters magnification with iris-diaphragm . . . . . **10.—**



Projection Apparatus (Edinger) Nr. 73

with

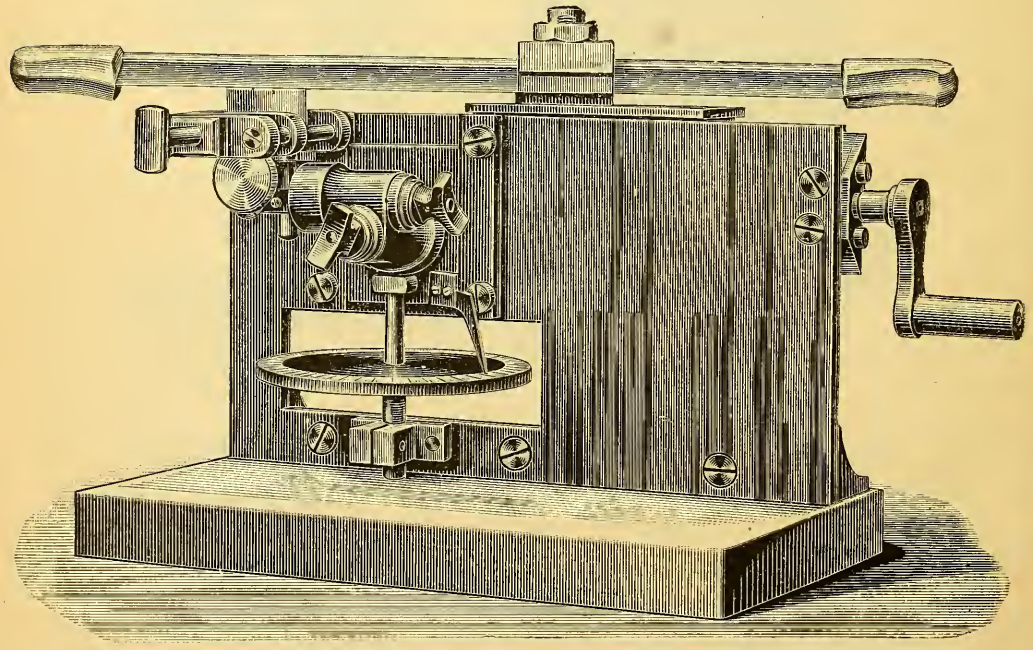
Photographic camera Nr. 75 (Nieser).

G. Microtomes.

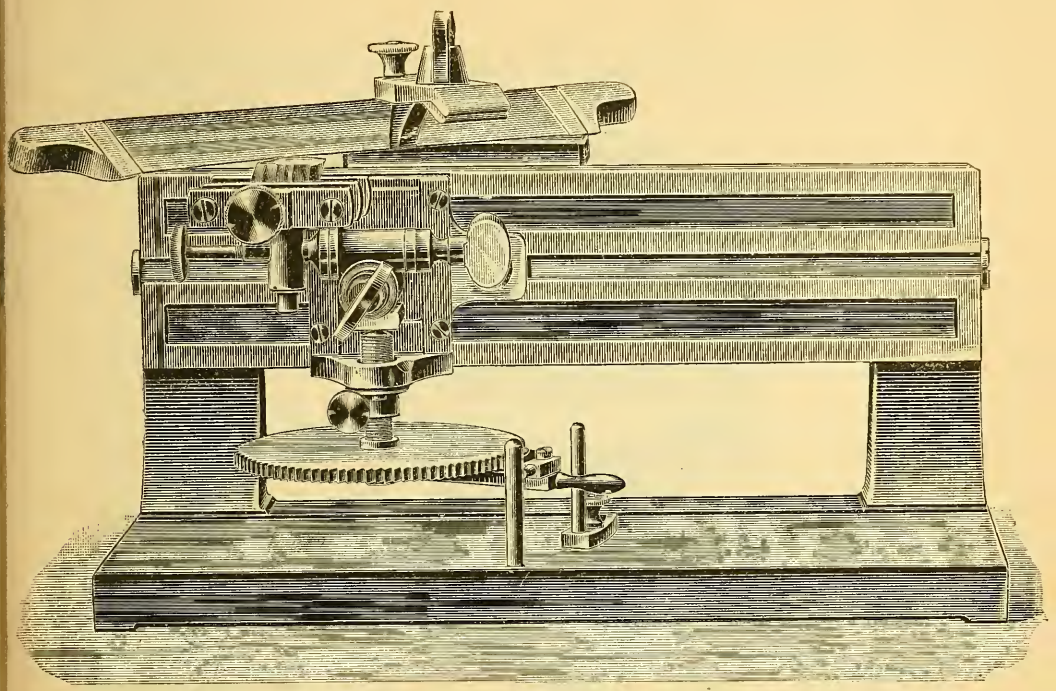
There is also a special catalogue of microtomes.

We offer six different styles of microtome, thus furnishing the apparatus to meet every requirement of that instrument. The first two microtomes, constructed on the model suggested by Prof. R. Altmann, enables the histologist to obtain sections one one-thousandth of a millimeter thick without difficulty. Microtome Nr. 3 is particularly adapted to rapidly making serial sections. Three smaller microtomes are added to these larger ones, which, though less perfect, are still sufficient for many of the requirements of the microtome for microscopic purposes.

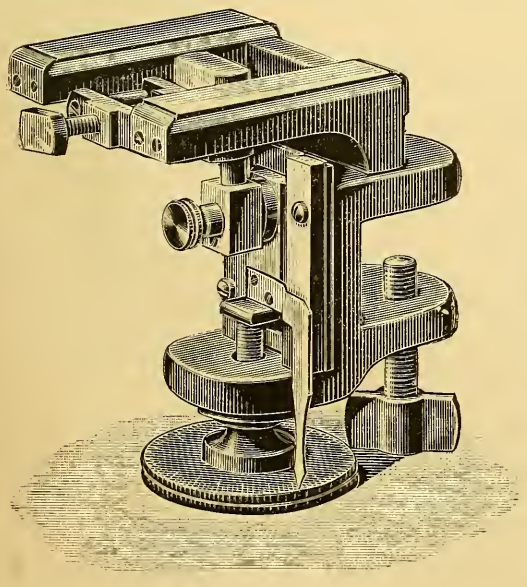
Nr.		$
77.	**Large microtome** Nr. 1 in mahogany box, without knife .	**64.—**
78.	**microtome** Nr. 2, similar	**48.—**
79.	**Large microtome** with sliding carriage for specimen Nr. 3.	**56.—**
80.	**Smaller microtome** of same construction Nr. 4	**36.—**
81.	**Small microtome** Nr. 5	**12.—**
82.	**Cylinder microtome** Nr. 6	**4.—**



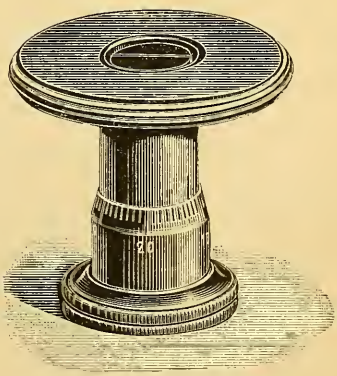
Large Microtome Nr. 2.



Large Microtome Nr. 3 (sliding carriage).

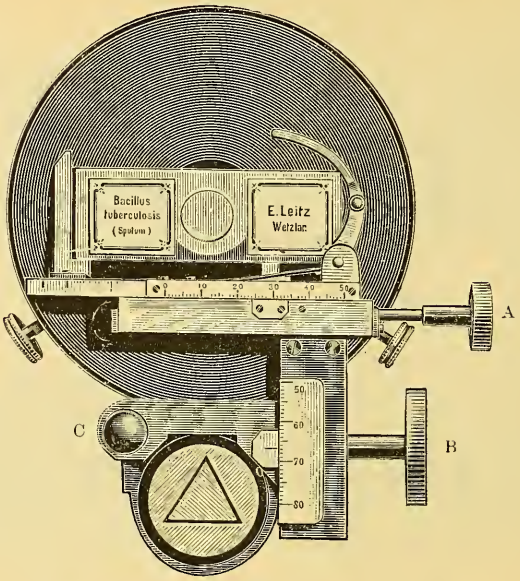


Small Microtome, Nr. 5.



Cylinder Microtome, Nr. 6.

H. Miscellaneous Apparatus.



New Mechanical stage Nr. 83.

Nr. $

83. New mechanical stage, adjustable to stands I, Ia, Ib and to the mineralogical Stands I and II. It is fastened to the stage of the microscope by means of the screw C and a cross-bar, and may be removed with the greatest ease by simply loosening the screw. It has two movements at right angels to one another, each provided with a millimeter scale. The lateral movement is 50 mm in extent and is accomplished by turning the screw A; the movement perpendicular to it is 30 mm and is regulated by the screw B.

The adjustment and finish of this stage is most perfect adapting it to the nicest uses of a mechanical stage. Thus, the finding again of a marked spot in any specimen is most easy when the position of the two scales was noted at a previous examination, and this obtains even after removal of the stage and its readjustment to the microscope, for, so accurately does it fit the stage of the microscope that its position must be always the same . . . . . **28.—**

Nr.		$
84.	**Polariscope** for mineralogical investigations and for examination of food-stuffs. Analyser on an eye-piece which fits into the tube of the microscope; graduated index with pointer. In ordering it is necessary to state whether the microscope to which the polariser is to be fitted is provided with an Abbe condenser or not	20.—
85.	**Simpler Polariscope,** without special eye-piece	12.—
86.	**Gypsum plates,** assorted, 8 pieces	3.75
87.	**Warm stage** after M. Schultze, for comparatively high temperatures with condenser	13.50
88.	**Warm Stage** after Pfeiffer. Glass cell, which is filled with water. Sufficient for temperatures up to 44° C	6.75
89.	**Warm Stage** after Stricker. A hollow cell which is filled with water, with condenser	14.—
90.	**Coverglass Tester.** For measuring the thickness of coverglasses	3.75
91.	**Triple Nose-piece**	8.—
92.	**Double Nose-piece**	6.—
93.	**Iris Diaphragm**	6.—
94.	**Condensing Lens,** on Stand, 80 mm diameter	12.—
95.	**Condensing Lens,** on Stand, 60 mm diameter	8.—
96.	**Compressor**	4.—
97.	**Glass Slides,** with cell ground out; per Dozen	2.25
98.	**Glass Slides,** edged ground; per Gross	1.50
99.	**Hollow-ground slide,** for use as a moist chamber	0.50
100.	**Coverglasses,** of usual size (15 to 15 mm), assorted according in thickness; per 100	0.75
101.	**Coverglasses,** of various thicknesses, mixed, per 50	0.30
102.	**Coverglasses,** round, 15 mm diameter, per 100	1.—
103.	**Turn table,** for ringing specimens	3.50
104.	**Thickened Cedar Oil** for the oil-immersion lenses, 50 grams	0.50

Nr. $

105. **Saccharimeter** (improved Mitscherlich). For determining the content of sugar in liquids by measuring the angle of rotation. Consists of a tube, mounted on a stand with a concave mirror, and containing a Nichol's prism, a graduated collar and index and a small lens for reading the exact angle of rotation. The rotation of the prism is accomplished by means of an endless screw, and the reading is taken when the two portions of the quartz plate show the same colour. Two tubes of 100 and 200 millimeters depth, for the liquid to be examined, accompany the apparatus . . . . . **40.—**

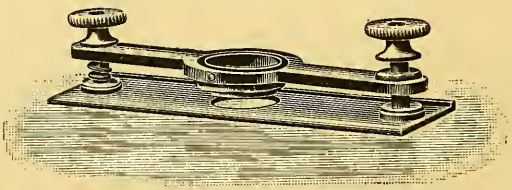
106. **Box,** containing a razor, a lifter, two small knives, straight and curved scissors, forceps, two needles, and two lancet-pointed needles . . . . . **8.—**

107. **Box,** containing a razor, a lifter, a small knife, two needles, scissors and forceps . . . . . **6.—**

108. **Box,** containing a small knife, scissors, forceps and two needles **3.25**

109. **Botanical Outfit:** Box, containing a small knife, forceps, self-closing forceps with horn handle, two scissors, two needles and two simple lenses. . . . . **8.—**

110. **Leather Travelling Cases,** made to fit over the mahogany microscope cases and to protect it from injury. Price varies according to the size from . . . . . **4** to **8**



Compressorium Nr. 96.

The following will be sent post-paid on application:

1. This catalogue in
   a) German,
   b) French,
   c) English.
2. Catalogue of Microscopes for Mineralogical Examinations (German).
3. Catalogue of Microtomes (German).
4 Anleitung zum Gebrauch des zusammengesetzten Mikroskops.
5. Instructions pour l'emploi des microscopes.
6. Die Zählung der roten Blutkörperchen mit dem Thoma'schen Apparat.
7. Anleitung zum Gebrauch des Mikro-Spektroskops.
8. Anleitung zum Gebrauch des mikrophotographischen Apparats (nebst photographischer Technik und 6 Lichtdrucken nach Photogrammen).

JULIUS KLINKHARDT, LEIPZIG.